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Ancient grooved stone axes from an alluvial terrace on Stonewall Creek, Kimberley, Western Australia

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Abstraet

Stone artifact assemblages probably relating to two successive stone industrial phases identified in other reglonal sites have been found at an alluvial terracc on Stonewall Creek, a tributary of the Ord River, Kimberley, Western Australia. Two of three grooved stone axes from the surface of a truncated soil at the terrace site are carbonate and iron encrusted, the source of the carbonate encrustations being an eroding younger soil unconformably overlying the truncated soil. The cncrusted axes are older than a typical Ord valley late-phase stone artifact assemblage found on the surface of the younger soil. Correlations with similar grooved axes from Mlriwun, a local rock shelter, and from Arnhem Land, where a similar two-phase stone industrial succession is known, suggest that the Stonewall Creek axes belong to the early Ord valley stone industrial phase, and are possibly early Holocene or late Pleistocene in age. Various data show that hunter-gatherer adaptation ln the Ord valley may have been relatively stable since the late Pleistocene.

Introduetion

In 1972, while engaged in a programme of archaeological salvage and survey, I recorded a number of archaeological sites on alluvial terraces in the Ord valley, Kimberley, Western Australia. This account describes the depositional sequencc of stone artifact assemblages recovered from an alluvial terrace on Stonewall Creek, one of the tributaries of the Ord River and notes several significant artifacts from there. This site and its artifact assemblages have been briefly noted by Dortch (1977) and Mulvaney (1975, p. 194).

Stonewall Creek drains a 300 km² catchment area of barren ranges, rocky outcrops and semi-arid structural plateaus east of the Ord River (Fig. 1). This small stream system flows only during the summer wet season when the typically intensive rains often cause heavy flooding. During floods the system is capable of carrying relatively very large amounts of sediment, with the result that the shallow, braided middle reaches of Stonewall Creek are marked by massive alluvial terraces composed of gravel, sand and clay.

The Stonewall Creek terraee site

Numerous scatters of stone artifaots, presumably the remains of old campsites, occur on the surface of the terraces on Stonewall Creek. The largest and most important of these known at present is located on a weathered, partly eroded terrace situated within the fork of Stonewall Creek and one of its tributaries 19 km east of the Ord River (16° 01′ S, 128° 52′ E; Fig. 1). The terrace, extending over 2 ha, has been used extensively as a campsite during the past, its chief attraction perhaps having been a series of semi-permanent pools in the granite bed of the main channel (Fig. 1). Much of the terrace is heavily eroded, and other parts have been badly damaged by gravel quarrying and other activities related to the construction of the adjacent paved road.

The alluvial terrace consists of two sedimentary units (Fig. 2). The upper or younger is a reddish sandy soil containing varying amounts of gravel; it unconformably overlies a light-coloured deposit which interfingers with thick pebble beds resting on the granite bedrock. This sequence of sediments ranges in thickness from 1-3 m, and always there is a clear interface between the reddish and light-coloured units. Two similar units extend in a terrace along the north bank of Stonewall Creek for several hundred metres downstream, and similar depositional sequences are exposed in other terraces several kilometres downstream. Gravel lenses occur within both units, and in one section there is a thick band of gravel separating the two units. There are also sections along the stream where the reddish sandy soil rests directly on the pebble bed above the bedrock. Thus the two units are not co-extensive and so are not components of a single soil profile.

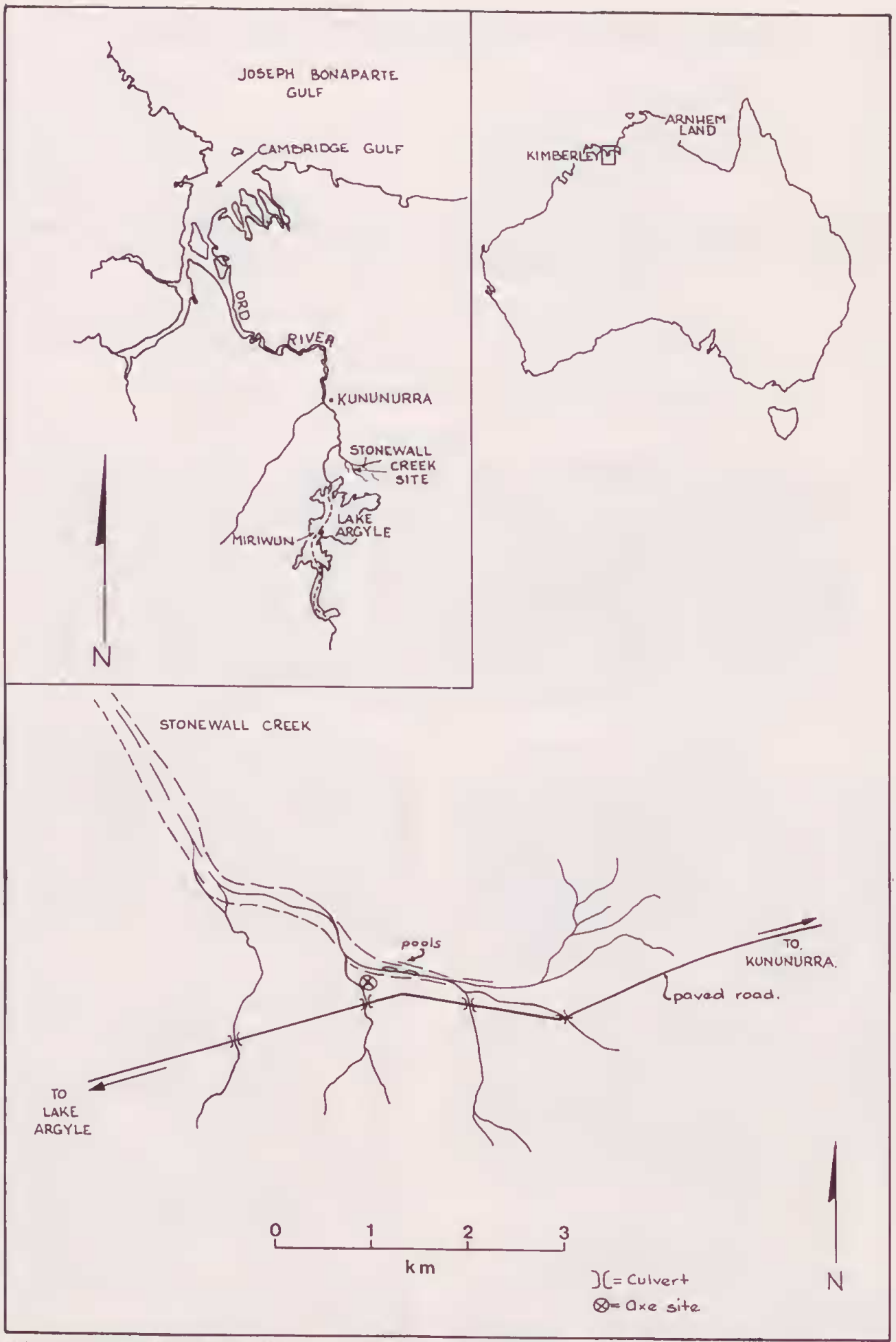

Figure 1.—The Stonewall Creek terrace site and the lower Ord valley, showing sites and localities mentioned in the text.

In all sections or horizontal exposures the light-coloured deposit has the appearance of a truncated soil. Using Stewart's classification of soils in the Ord-Victoria basin (Stewart 1970) the unit was tentatively identified as the subsoil of a laterite podzol. Dr. G. A. Stewart, Land Resources Management, C.S.I.R.O., Canberra, has in part confirmed this identification, and suggests that it is the subsoil of a lateritic podzol of the Florina type or a meadow podzolic soil of the Marrakai type (G. A. Stewart, personal communication, 1973; Stewart 1970, p. 98). Both types of soils are poorly drained, decalcified, with ferruginous concretions or orange mottling throughout their profiles.

Preliminary first-hand examination of the light-coloured deposit shows that it is a pallid (yellowish-grey), cemented gritty clay with orange mottling; it is decalcified, weathered, and has a blocky columnar structure with cracks extending downward 30-70 cm (Fig. 2). Exposed horizontal surfaces contain numerous small ferruginous concretions, some clearly weathering out of the deposit. At one horizontal exposure, referred to below as the axe site, a small part of the surface, a few centimetres higher than the rest, has on it a 3 mm thick carbonate encrustation which is regarded as a remnant of a band of secondary carbonate derived from the weathering of the formerly overlying reddish sandy unit.

Stone artifact assemblages

The reddish sandy unit extends over most of the terrace within the fork of the two channels; it is completely removed in places leaving the surface of the underlying light-coloured deposit exposed over areas 50 to 1 000 m². The surface of the upper unit contains several hundred stone artifacts including numerous pointed blades of the lelira category, various kinds of invasively flaked points, some large (non-microlithic) backed points, some adze flakes and small flake-scrapers, a few flakes probably struck from discoidal or Levallois cores, a bifacially flaked edge-ground axe, denticulated and notched flakes, blades and bladelets, a number of core and pebble tools, and several grindstones or anvils, all of which typify the Ord valley late stone industrial phase (Dortch 1972; 1977).

This assemblage is concentrated on the northern and eastern parts of the terrace surface, where the reddish unit is largely uneroded, and on an adjacent, 600 m² deeply eroded exposure of the light-coloured deposit. A 30 cm² test pit dug into a partly eroded area of the reddish unit yielded two flakes about 10 cm below the surface and 20 cm above the lower unit.

None of the artifacts from the terrace shows signs of rolling or battering, and it is assumed that most if not all result from occupation of the terrace itself. Until now only one stone artifact has been collected from the stream bed

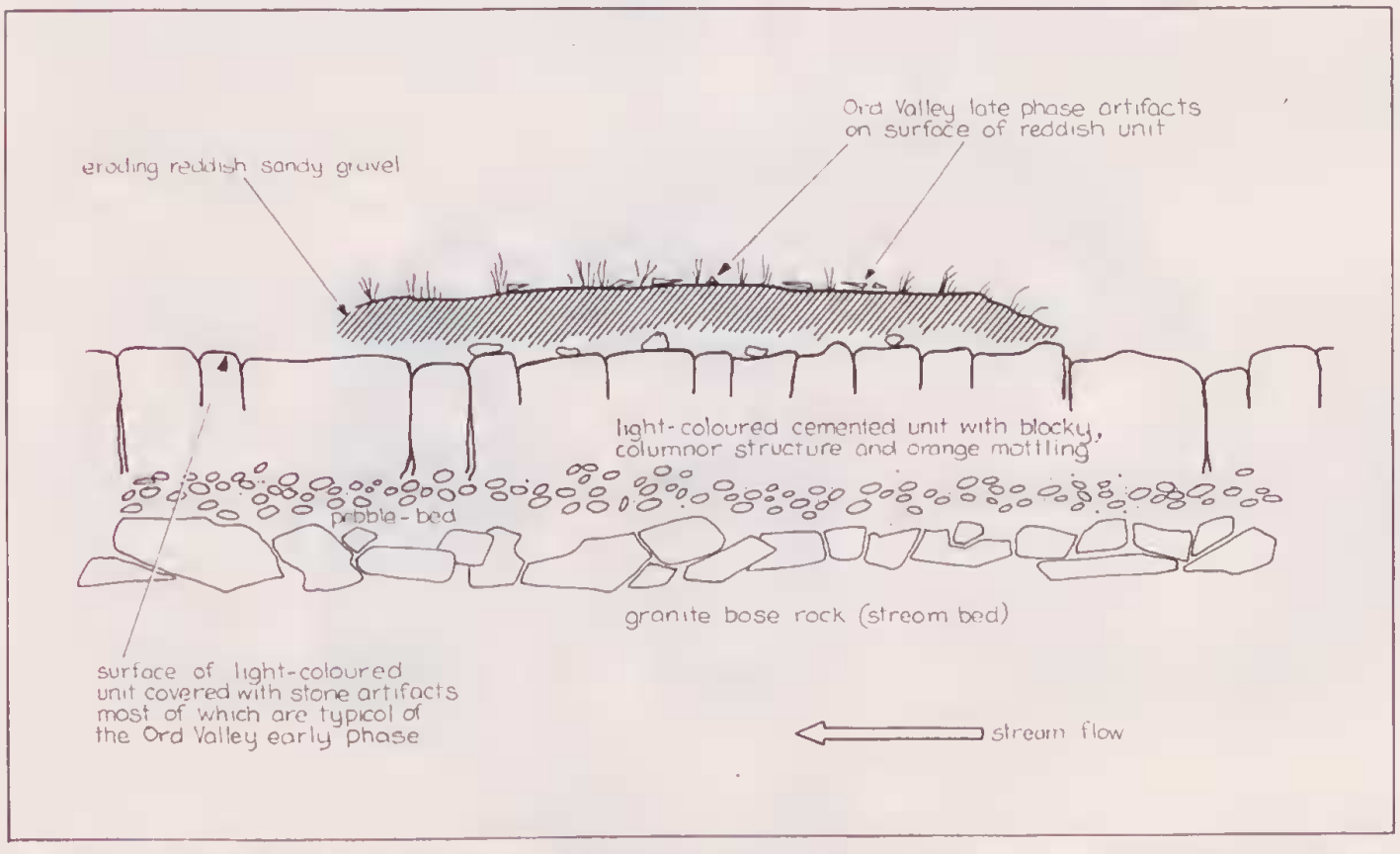

Figure 2.—Schematized view of the western edge of the axe site at the Stonewall Creek terrace site, Kimberley, Western Australia. The face of the reddish sandy unit is 50 m east of the lower unit's face.

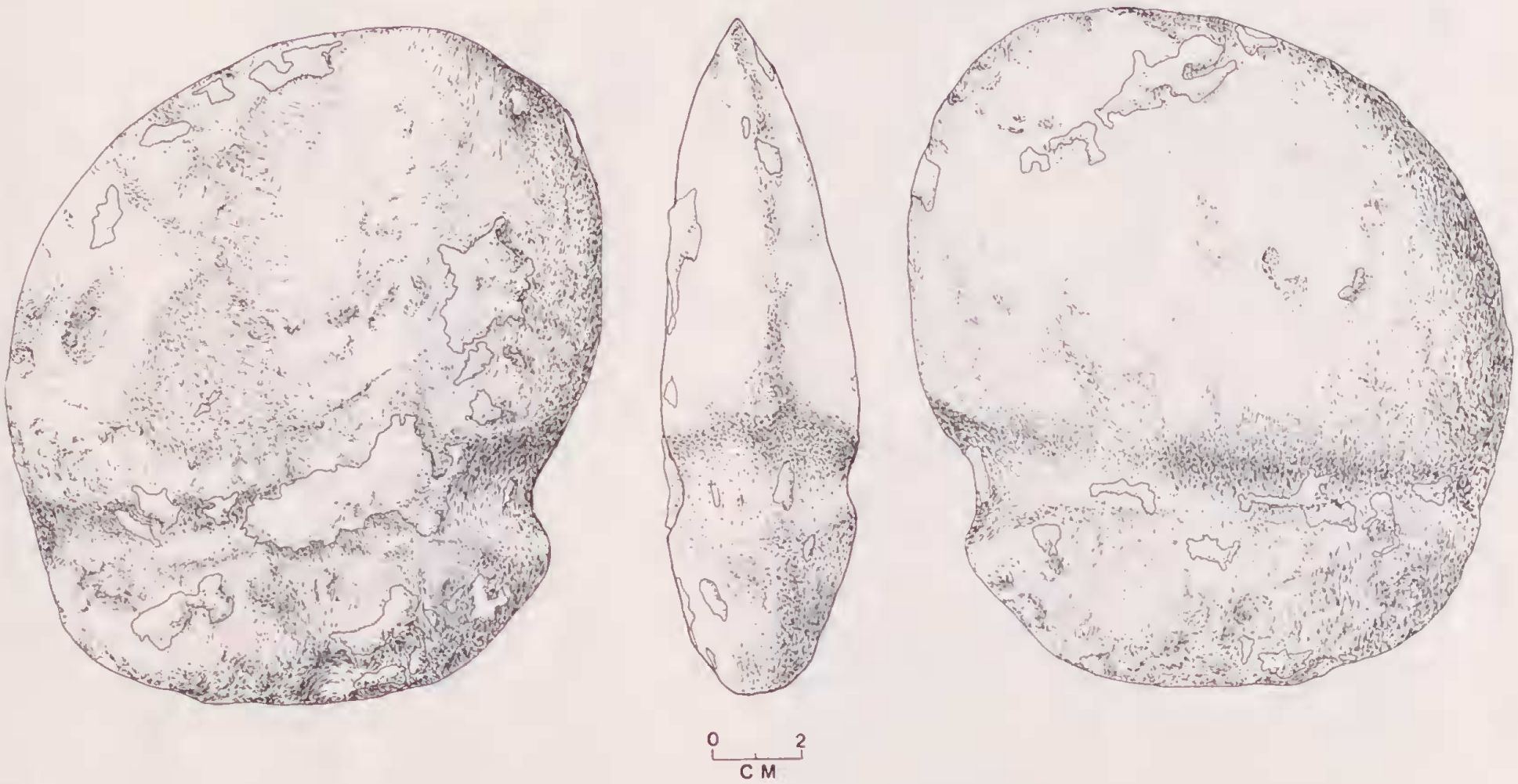

Figure 3.—Axe B2212 from the Stonewall Creek terrace site.

immediately downstream from the terrace and none from the two channels forming the fork. However there are numbers of rolled artifacts in the stream bed a few kilometres downstream as well as in other stream channels in the Ord valley.

The main exposure of the underlying light-coloured deposit is at the terrace's western edge (Fig. 2). This is one of the most extensively eroded parts of the terrace, possibly because a large culvert a few metres upstream (Fig. 1) has the effect of confining and so increasing the velocity and scouring capacity of flood waters in the smaller channel. On the surface of this 1 000 m^2 exposure there are numerous weathered stone artifacts most of which are considered to be representative of the early Ord valley stone industrial phase (Dortch 1972; 1977; see discussion), a few points and blades typical of the later phase, and several tool forms common to both phases. Included are three pecked, ground and grooved axes, horsehoof cores and pebble tools, a number of thick flake-scrapers and notched flakes, and several grindstones and anvils. This assemblage is interpreted as a mixture of tools of different ages, though most of them, including the three axes, probably result from early-phase occupation at the site.

The three grooved axes were found within 60 m of one another on this exposure (i.e. the axe site, Figs. 1, 2). One of them (B2212; Fig. 3) was partly buried in what seemed to be superficially re-worked surface sediments from the light-coloured deposit. Another (B2213; Fig. 4) lay in a shallow gully cutting through the light-coloured deposit. Carbonate and iron encrustations on both faces of these two axes show that they have been buried within or beneath a weathering deposit. The third grooved axe (B2226; Fig. 5), an extremely weathered specimen, was found on a gravel bed exposed in a heavily eroded part of the light-coloured deposit. A photograph of this axe *in situ* is seen in Mulvaney (1975, pl. 63).

Each of these axes has been partly shaped by pecking or hammer dressing though specimen B2212 seems to have been invasively flaked on one face (Fig. 3, left) before being pecked and ground. Bifacial grinding on specimens B2212 and B2226 (Fig. 5) extends from cutting edge to groove, whereas on specimen B2213 (Fig. 4) this is restricted to the cutting edge. The groove encircling each specimen has presumably been produced by pecking, or by a combination of pecking and abrasion. The very weathered condition of these axes prevents positive surface identification of the rock of which they are made. Mr. J. Clarke, Conservation Department, Western Australian Museum, has tentatively identified the stone of each specimen as gabbro or dolerite (J. Clarke, personal communication, 1976).

Since the light-coloured deposit is decalcified, the source of the carbonate encrustations on axes B2212 and B2213 is the younger unit, the reddish sandy soil. These two axes were either exposed on the truncated surface of the light-coloured deposit, prior to its burial by the reddish soil, or they were buried within this younger unit. The first alternative is more likely, since, as noted above, the surface on which they lay itself retains fragmentary remains of a secondary carbonate crust. No other artifacts from the terrace site are encrusted, and the only other encrusted artifacts presently known from the area are several weathered flakes, a pebble chopper and a possible upper grindstone from an exposure of a truncated soil several hundred metres downstream which is similar to the light-coloured deposit at the axe site.

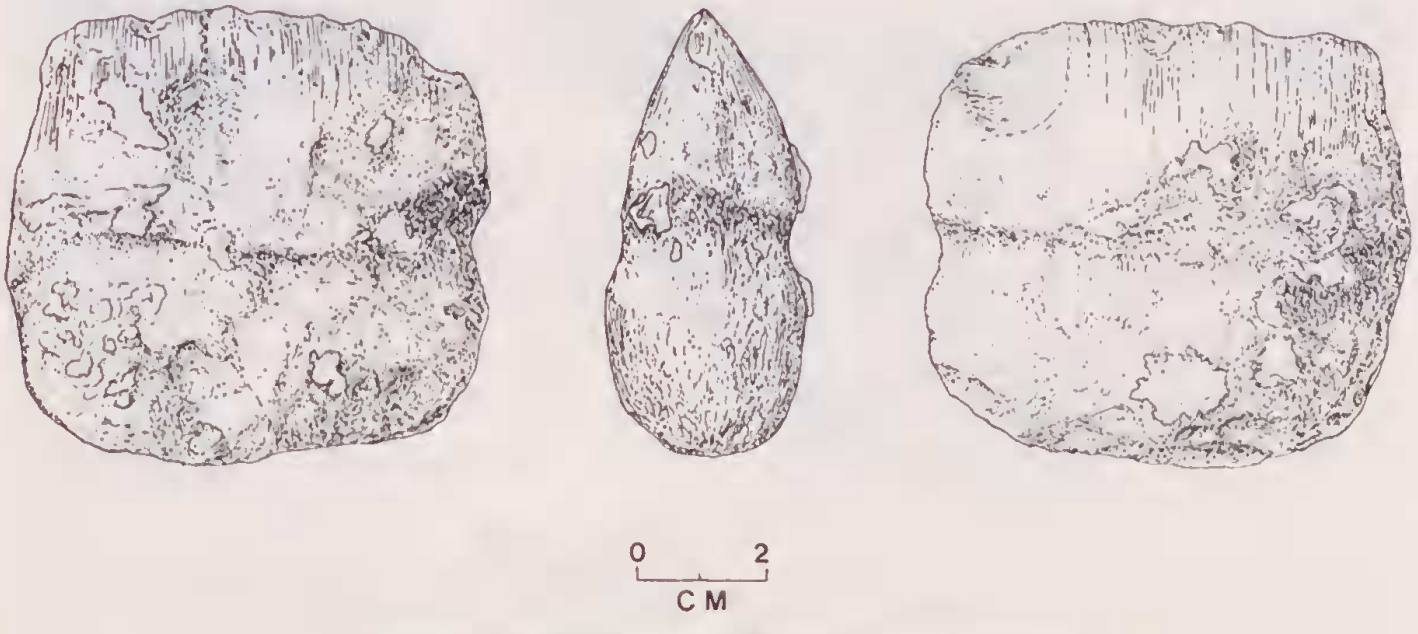

Figure 4.—Axe B2213 from the Stonewall Creek terrace site.

It is clear that the two carbonate and iron encrusted axes are older than the stone artifacts from the surface of the reddish sandy soil, though they are not necessarily older than the soil itself. The two flakes excavated from within the reddish deposit could be younger than or much the same age as the two axes. None of the other artifacts from the various exposures of the light-coloured deposit at this terrace, including axe B2226 and other likely or probable early-phase artifacts from the axe site, can be unequivocally related to the artifact groups whose relative positions in the stratigraphical sequence is shown here.

The foregoing description of the stratigraphy of the terrace and its occupational sequence is firmly supported by this concise statement compiled by Dr. G. A. Stewart (personal communication, 1973).

> "From its thickness, colour and texture the lower light coloured sandy clay with orange mottles appears to be a truncated profile of either Florina (lateritic podzolic) or Marrakai (meadow podzolic) soil. It would have been formed under prolonged water-logging, but with enough through drainage that all soluble materials such as calcium carbonate would have been leached from the profile. The calcium carbonate crusting on tools on the surface of the light coloured material must have been leached from younger overlying sediments from which the reddish sandy soil was formed."

Discussion

In the above, the grooved axes from the older unit, and the point and blade assemblages from both units of the Stonewall Creek terrace site are regarded as representing, respectively, the earlier and later Ord valley stone industrial phases. The interpretation of the Ord valley stone industrial sequence as having early and

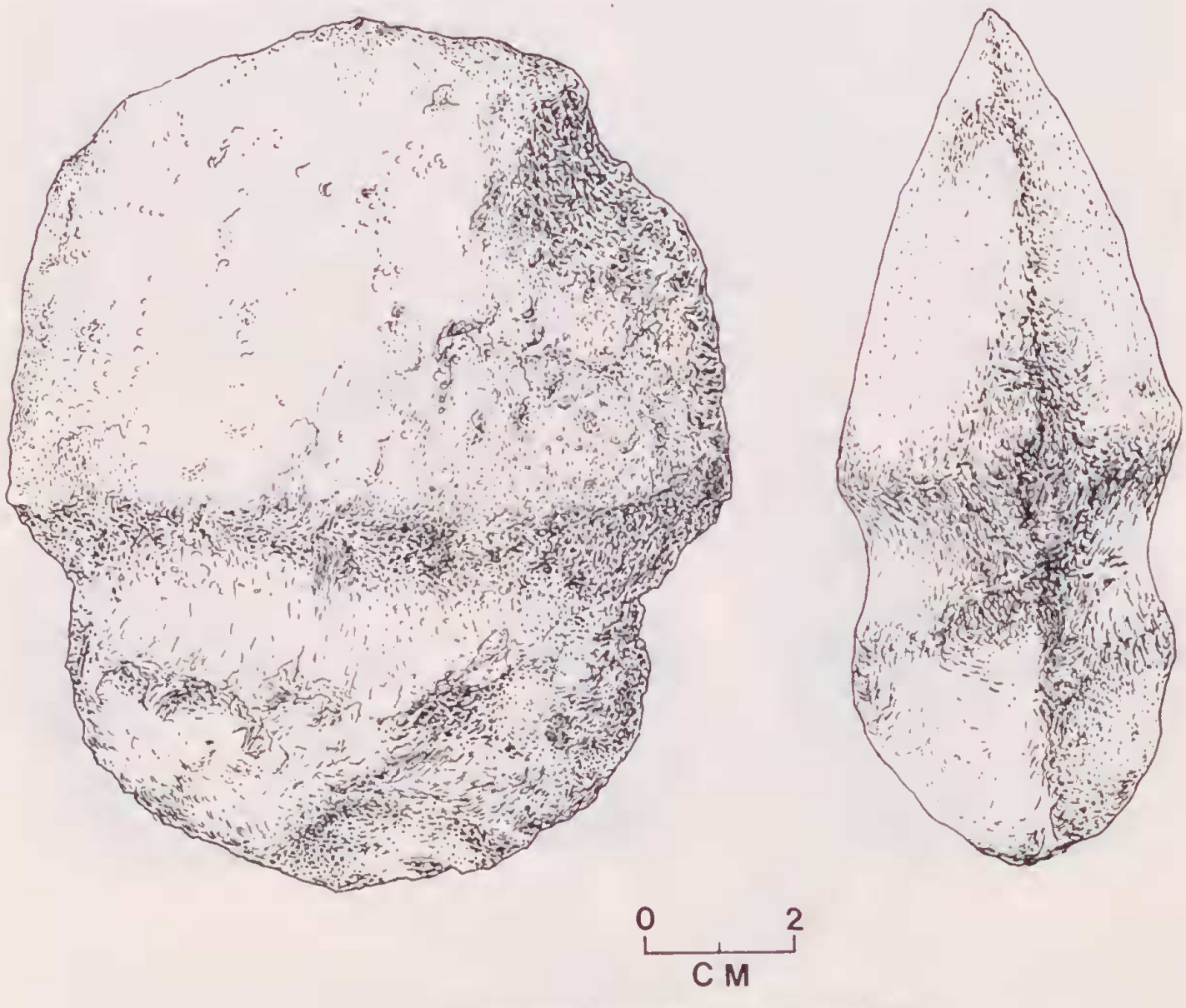

Figure 5.—Axe B2226 from the Stonewall Creek terrace site.

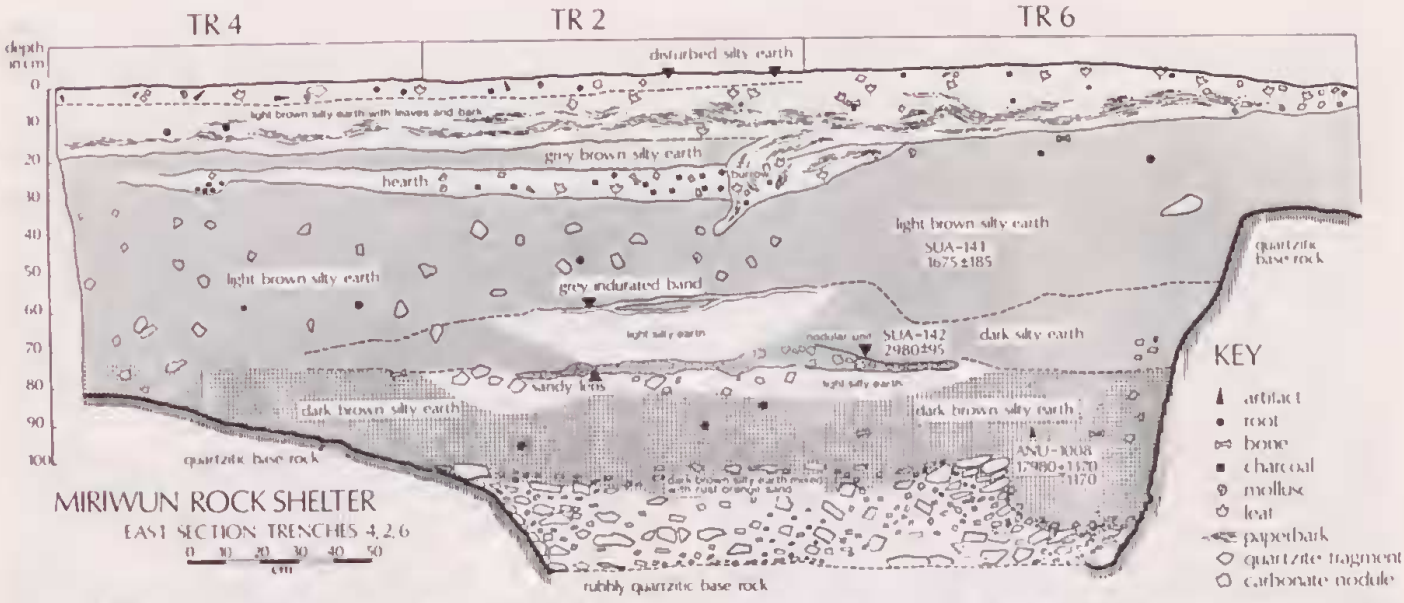

Figure 6.—East section of trenches 4, 2 and 6, Miriwun rock shelter, Lake Argyle, Kimberley, Western Australia. Approximate positions of radiocarbon dates mentioned in the text are shown.

late phases is very largely based on the succession of assemblages found in the stratified deposit at Miriwun rock shelter, a site 35 km SSW of Stonewall Creek which is now permanently inundated in Lake Argyle (Fig. 1; Dortch 1972; 1977).

The two lowermost layers (dark silty earth and dark brown silty earth) of the Miriwun deposit (Fig. 6) contain the definitive artifact assemblages of the Ord valley early stone industrial phase. These layers are overlain by several layers containing point, blade and flake tool assemblages typical of the Ord valley late phase, an industry identified at numerous open sites and rock shelters in the region. The later phase at Miriwun and other sites persisted until the modern era, and is part of the late-phase industrial complex which extends over the whole of Kimberley and western Arnhem Land (Dortch 1977). (For discussion of the distribution of stone points, adze flakes and other small flaked tools pertaining to this complex see Mulvaney 1975, p. 210-237.)

The upper of the two Miriwun early-phase layers (dark silty earth) is radiocarbon dated at 2 980 ± 95 BP (SUA 142). This date is unexpectedly young and needs confirmation by others relating to terminal early-phase assemblages in this region. A charcoal sample from the lower layer at Miriwun containing an early-phase assemblage (dark brown silty earth) was radiocarbon dated at 17 980 $^{+\ 1370}_{-\ 1170}$ BP (ANU 1008). Thus early-phase occupation at the Miriwun site extended over a very long period, perhaps as much as 16 000 radiocarbon years.

It is significant to note that, aside from the Stonewall Creek specimens, the only other pecked, ground and grooved axe known from the Ord valley comes from the upper part of dark silty earth at Miriwun (Fig. 6), and so is dated less than 3 000 BP (SUA 142). Also, from the lower part of the dark brown silty earth at Miriwun, dating to the late Pleistocene, there is a single flake with smoothing and striations on its dorsal face which has probably been struck from the face of a partly ground axe (Dortch 1977).

Stone axes are common features in Ord valley and other Kimberley late-phase assemblages. These axes are typically invasively flaked on both faces and only partly ground, and grooving is absent (cf. McCarthy 1967, fig. 30:11). Axes of this kind were being made by Ord valley Aborigines until a few decades ago, and older men of the Miriwung tribe, whose rightful lands extend over the area under discussion (cf. Tindale 1974, maps), are perfectly familiar with their technique of manufacture. I have shown the Stonewall Creek and Miriwun grooved axes to several Miriwung men, and they suggested that these are an earlier type.

The Ord valley grooved axes are typologically similar to the grooved axes associated with early-phase assemblages in Arnhem Land which are dated between about 6 500 and 25 000 BP (White 1967, 1971). It is probable that axes of this kind are also one of the characteristic components of the Ord valley early-phase stone industry, considering the provenances of the Stonewall Creek and Miriwun grooved axes, and the complete absence of such specimens in numerous Ord valley late-phase assemblages. The single flake with striated and smoothed surfaces from the dark brown silty earth at Miriwun also suggests that ground axes in the Ord valley date back to the late Pleistocene. However, tentative evidence for a grooved axe in a late-phase context in eastern Kimberley is provided by Tindale who found a site on Moolabulla Station 250 km south of Lake Argyle

where ". . . a Pirrian camping ground [presumably a point or late-phase assemblage] had in it a grooved pebble axe, while the overlying layer, representing the present time, had edge-ground axes . . ." (Tindale 1974, p. 85). The only other published report of Kimberley grooved axes seems to be in McCarthy (1967, p. 48).

The radiocarbon-dated faunal and stone industrial sequences at Miriwun show that early-phase economy there, dating back as far as the late Pleistocene, was similar to that recorded in this site's late-phase layers, the uppermost of which belong to the modern era (Dortch 1972, 1977). All these layers (Dortch 1977, fig. 4, tables 2, 3) contain the same range of animal foods, and the stone artifact assemblages in both phases include most of the same basic kinds of scraping, cutting, adzing, chopping and pounding tools. Several unequivocal grindstones are present in the late-phase assemblages, and a few probable fragments of lower grindstones and one definite upper grindstone occur in the early-phase assemblages. In short the most striking difference between the two phases is a very diverse and easily recognised range of small flaked tools (pointed blades, biface and uniface points, burins, etc.) present in the late-phase assemblages and absent in the early phase.

As noted elsewhere (Dortch 1977), Miriwun and the Stonewall Creek site can with some validity be interpreted as wet and dry season camps respectively. Hundreds of eggshell fragments of a summer-breeding water fowl, the pied goose (*Anseranas semipalmata*), throughout the Miriwun deposit show that the shelter was typically occupied during the summer wet season, though dry season occupation there cannot be discounted. Stonewall Creek, however, would often have been an uncomfortable or even unsafe campsite during the wet season, at least during past times when the stream regime was similar to that prevailing now. At present the stream system is notorious for sudden and violent flooding, and even after floods have subsided the terrace is sufficiently waterlogged and muddy to make camping unpleasant. On the other hand, during much of the dry season the site is attractive because of its very reliable pools; these can not only contain water through most of the dry months (June to November), but also during the early part of the season provide surprisingly large amounts of fish. Admittedly the evidence supporting season of occupation at these two sites is in need of further development and testing. Nevertheless these data show that in this part of the Ord valley occupation and subsistence patterns are likely to have been stable for a long time, and that the marked change in the stone industrial succession which took place here a few thousand years ago is not necessarily indicative of significant shifts in land use or economy.

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